TEACHERS' RETIREMENT BOARD

INVESTMENT COMMITTEE

SUBJECT: General - Asset Allocation/Actuary Discussion ITEM NUMBER: 8

ATTACHMENT(S): 3

ACTION: ____ DATE OF MEETING: June 6, 2001

INFORMATION: X PRESENTERS: Christopher J. Ailman
Allan Emkin
Mark Johnson

EXECUTIVE SUMMARY

One of the objectives for the 2000/01 fiscal year is to complete a comprehensive asset allocation review as required in the investment management plan. The initial review began at the February Investment Committee meeting with a panel discussion of various topics hosted by the CalSTRS consultants of PCA, Mercer, and Callan Associates. The project was put on hold to allow the newly appointed members an opportunity for a full orientation. The full study will cover at least five Investment Committee meetings and likely conclude with a new asset allocation plan in November or December of this year. To help re-start the review, staff has asked Allan Emkin of Pension Consulting Alliance, the Committee's general investment consultant, and Mark Johnson of Milliman & Robertson, the System's actuary to present a discussion of the asset allocation process and specifically the Fund's future cash flows needs and liabilities.

The following is a tentative outline of the topics to be discussed in subsequent meetings that pertain to the asset allocation process.

June	Review of cash flow needs and asset classes
July	Discussion and adoption of capital market assumptions
September	Discussion and adoption of decision factors and investment time horizon. Discussion and adoption of asset class constraints.
October	Review of optimization and potential asset allocation mixes.
November	Refinement and adoption of the new asset allocation targets.
December	Formal revision of the CalSTRS Investment Management Plan to incorporate the new assumptions and target allocation.

DISCUSSION

The asset allocation process cannot begin without a detailed understanding of the System's cash flow and required investment return. With the baby boom looming toward retirement most State pension plans are shifting from a positive cash flow (contribution less benefit payments) to a negative cash flow. This has significant ramification on the investment program and must be factored into the liquidity needs and cash flow of the asset allocation. Hence, Mr. Johnson will review the future cash flow of the System.

The next step will be to select which asset classes should be included in the study. To this end, Allan Emkin will review the basics of each asset class under consideration and the current trends in asset allocation (Attachment 1). This is a very interesting time in the U.S. financial markets to conduct an asset allocation study. The past several studies in 1995, 1997 and most recently in July 1999, were all during a period of tremendous innovation and growth for the U.S. economy and equity markets. From 1997 to 1999, the U.S. economy fueled almost half of the growth in the world economy.

The backdrop for this asset allocation study is included and labeled attachment 2. The U.S. economy has ended the historic decade long period of economic expansion. The double-digit returns of the 1980's and 1990's may not be as easily achieved moving forward. After this wonderful period of historic financial markets, we may see a new period of more "normal' single digit financial returns, (if anything can be called normal in the financial markets). All this being said, one thing remains clear, no one can accurately forecast the future.

Despite the uncertainty about the future, the next step in the process requires the Committee to approve a set of assumptions about future asset class returns and their correlation to each other. The uncertainty about future returns highlights the need to look at the very long-term historical trends to help develop realistic expectations about the capital markets. To help begin the discussion on the CalSTRS assumption about future capital market returns, PCA has included their assumption and asset class correlations (Attachment 3). Since this is a very significant input to the model, this discussion will continue to the July Investment Committee Meeting where staff will present a formal recommendation for the CalSTRS 2001 capital market assumptions. Staff will compare and contrast the forecasts for all three general consultants and receive input from the specialty consultants in private equity and real estate. These assumptions will be used at the September and October meetings to generate an efficient frontier of optimized asset allocation mixes.

Overview of Current Asset Allocation Issues

Pension Consulting Alliance, Inc.

May 2000

DISCUSSION DRAFT

Topics

I. The Trend of Interest Rates

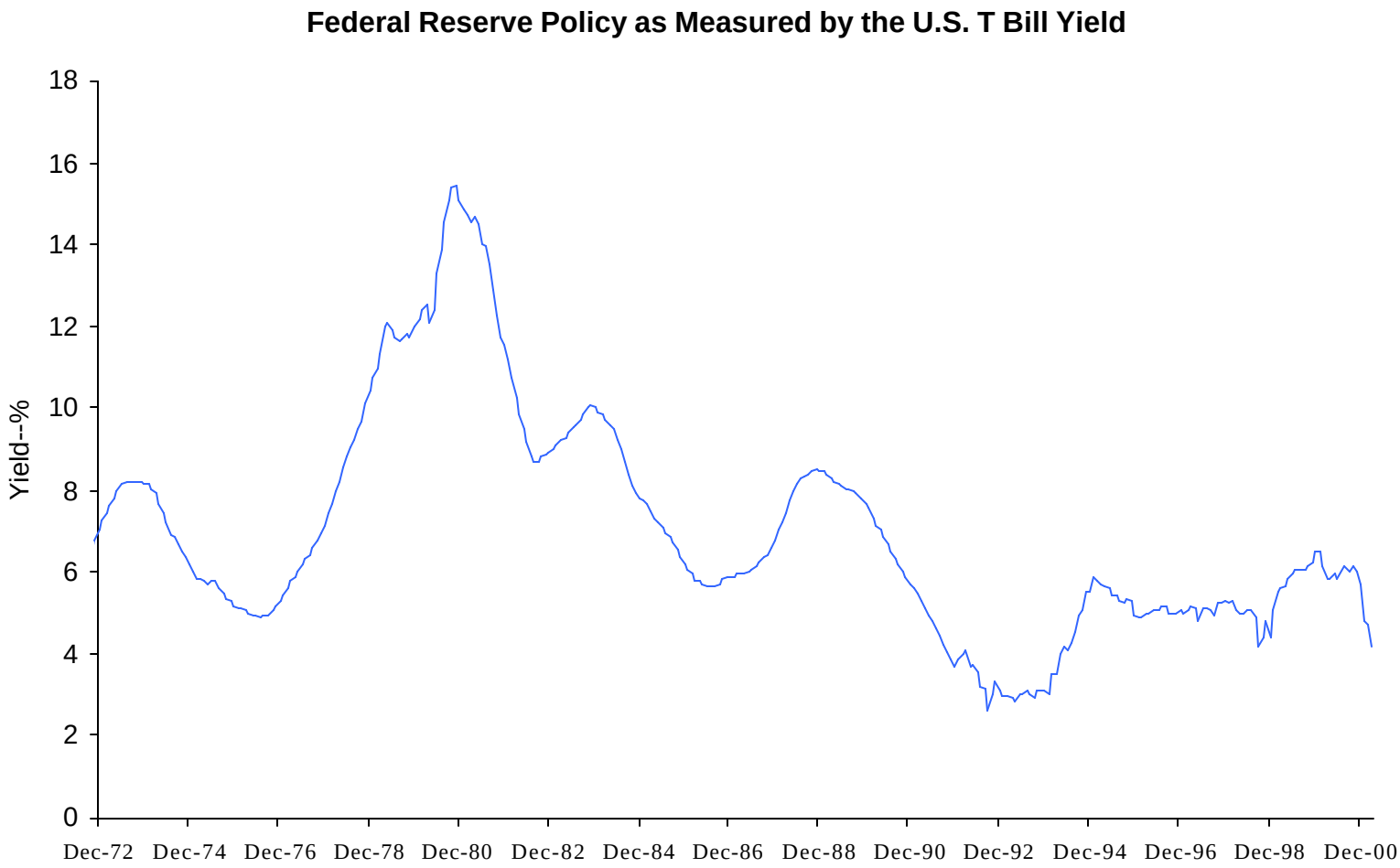
I. The Future of the Equity Risk Premium

III. Globalization and Diversification

IV. Private Equity Trends

VI. Real Estate Trends

Interest Rates



- **Lower interest rates could alter actuarial discount rates**
- **Lower long-term interest rates favorable to corporations and other issuers**

The Equity Risk Premium

- **Two historical tenets in asset allocation**
  - Equities outperform bonds over very long periods of time (the difference is the equity risk premium)
  - Equities' absolute returns are higher than assumed actuarial discount rates
  - Average long-term expectation: 3% to 5%

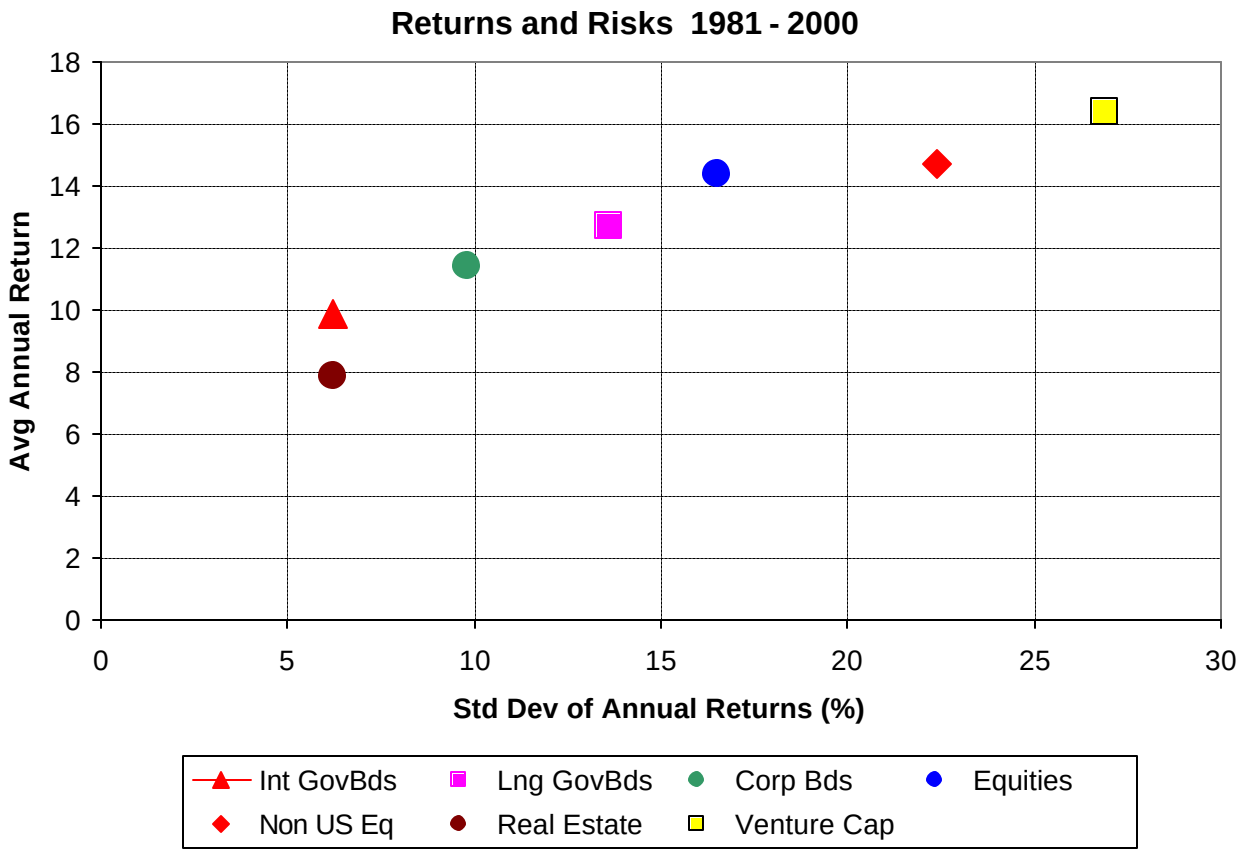
- **What if the equity risk premium fails to achieve these results?**
  - Some experts say that market valuations are still too high and dividends will grow only slowly[1]
  - The debate is over future economic growth, valuation and the legitimacy of dividends as a source of return
  - If discount rates are set to decline, liabilities will expand materially, leading to unfunded situations

- **The smaller the equity premium, the more difficult it becomes to pay future benefits**

- **Contributions will have to rise**

[1] "Death of equity risk premium predicted," Pensions & Investments, November 13, 2000

The Equity Risk Premium

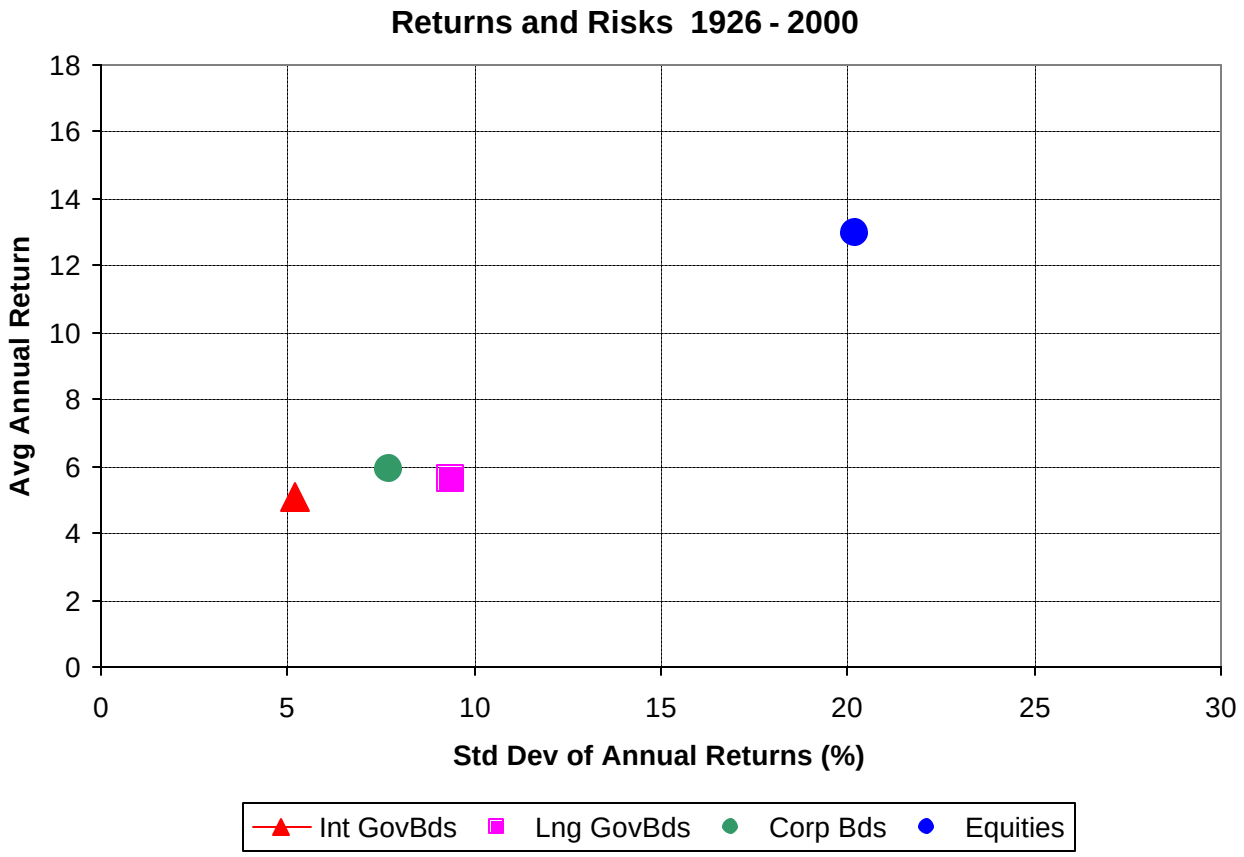


1981-2000	Avg Annual Return	Avg Annual Risk
Int GovBds	9.9	6.2
Lng GovBds	12.7	13.6
Corp Bds	11.4	9.8
Equities	14.4	16.5
Non US Eq	14.7	22.4
Real Estate	7.9	6.2
Venture Cap	16.4	26.9

- **Last 20 years: high absolute returns, equity excess return below average but lower risk**

Benchmarks: Lehman IntGov, Ibbotson IntGov, Lehman LngGov, Ibbotson LngGov, Lehman Corp, Ibbotson Corp, S&P 500, NCREIF, Brinson VC, Venture Economic PVI

The Equity Risk Premium

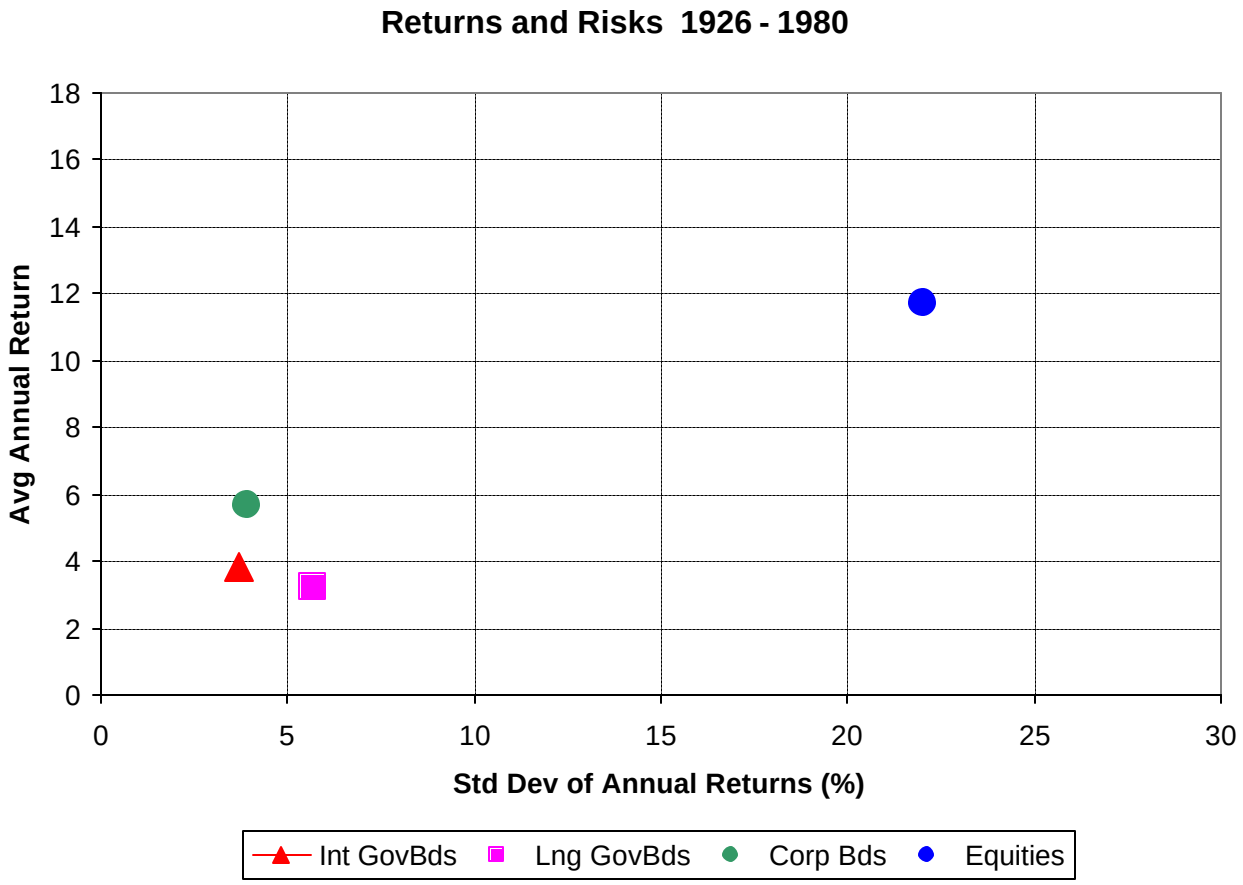


1926-2000	Avg Annual Return	Avg Annual Risk
Int GovBds	5.1	5.2
Lng GovBds	5.6	9.4
Corp Bds	5.9	7.7
Equities	13	20.2

- **Last 75 years: equity excess return commensurate with excess risk**

Benchmarks: Lehman IntGov, Ibbotson IntGov, Lehman LngGov, Ibbotson LngGov, Lehman Corp, Ibbotson Corp, S&P 500

The Equity Risk Premium

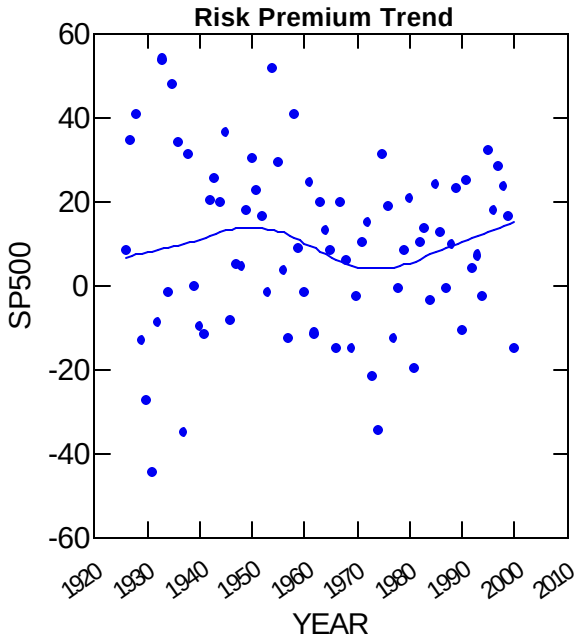


1926-1980	Avg Annual Return	Avg Annual Risk
Int GovBds	3.8	3.7
Lng GovBds	3.2	5.7
Corp Bds	5.7	3.9
Equities	11.7	22

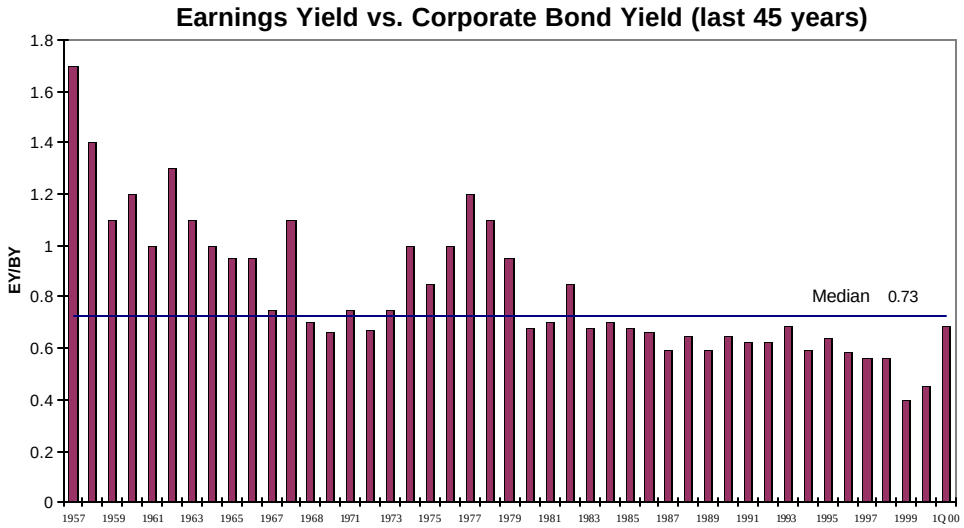
- **Prior 55 years: lower absolute returns, but higher equity excess return and risk**

Benchmarks: Lehman IntGov, Ibbotson IntGov, Lehman LngGov, Ibbotson LngGov, Lehman Corp, Ibbotson Corp, S&P 500

The Equity Risk Premium



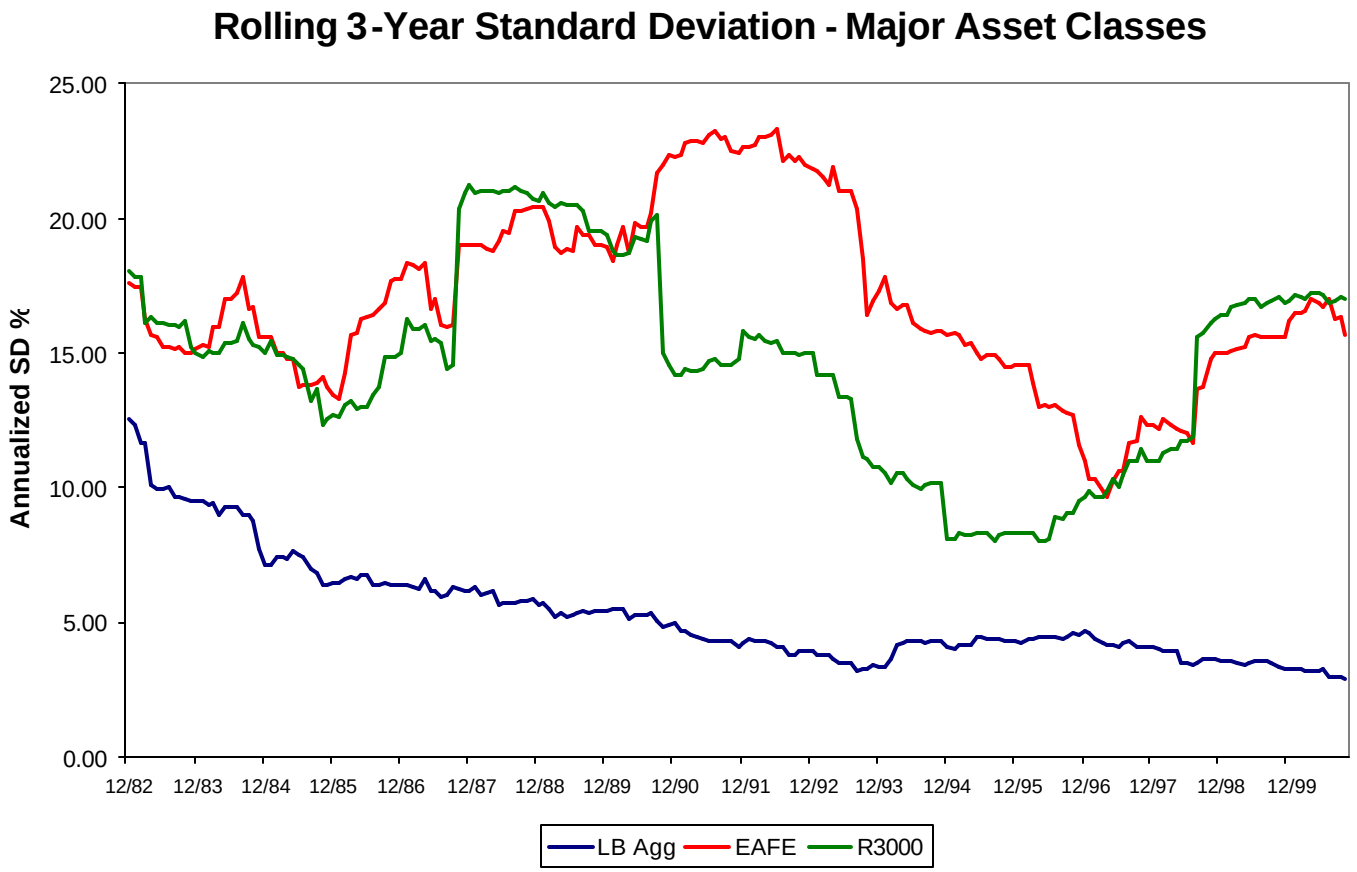
- **Long-term trend indicates a cyclical shift in risk premium, but not a near-term trough**
- **Long-term trend has never been negative, but that's the current debate**



- **Review of current consensus expectations indicates equities approaching fair value**

Sources: PCA, Leuthold Group, Morgan Stanley, Goldman Sachs, WSJ

Review of Risk Trends

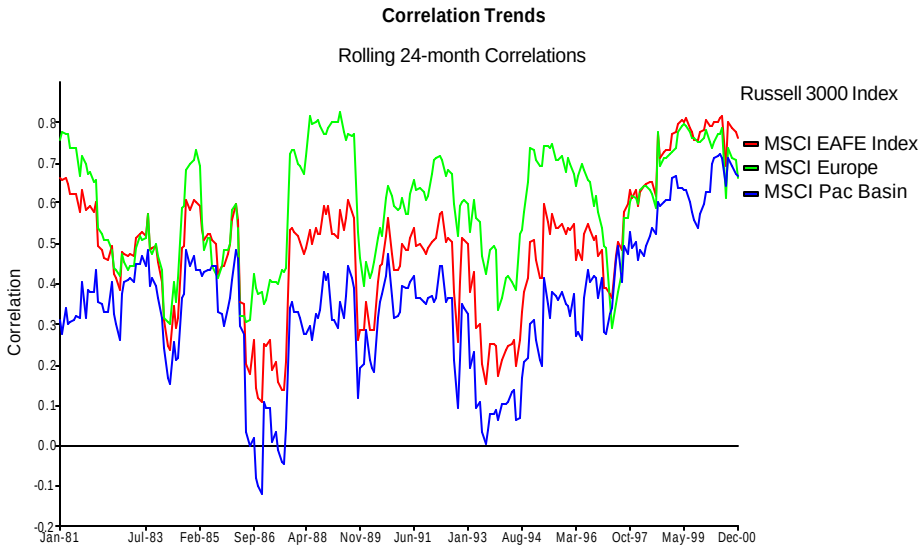


- **Equity volatility has more than doubled since the mid-1990's, reverting to long-term average**
- **Bond volatility at historically low level**

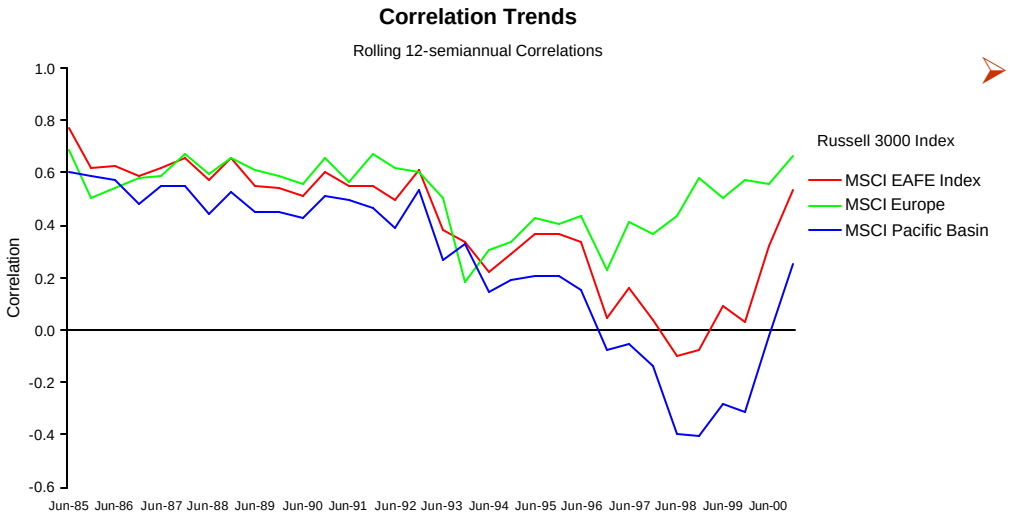
Globalization and Diversification

- **Basic tenet: As globalization increases, diversification is harder to accomplish**
  - Hypothesis: economic sectors and investment style dominate regional/currency differences
- **If globalization unfolds then portfolio structuring process (vs. asset allocation) becomes critical**
- **Evidence of globalization of investment markets is mixed**

Globalization and Diversification



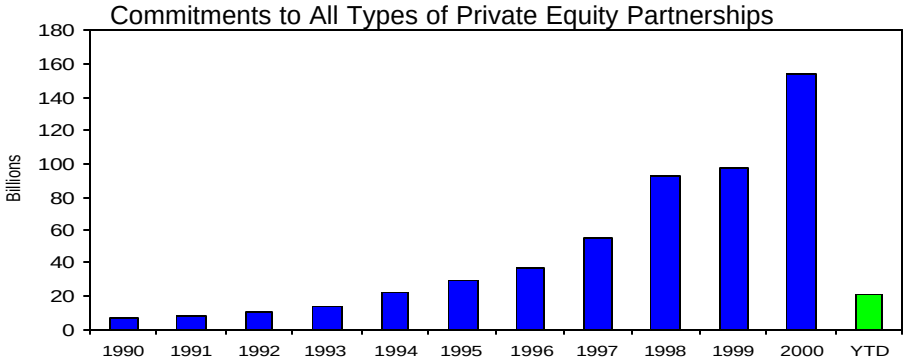
- Based on monthly rebalancing, correlations among equity classes have been rising since 1993...



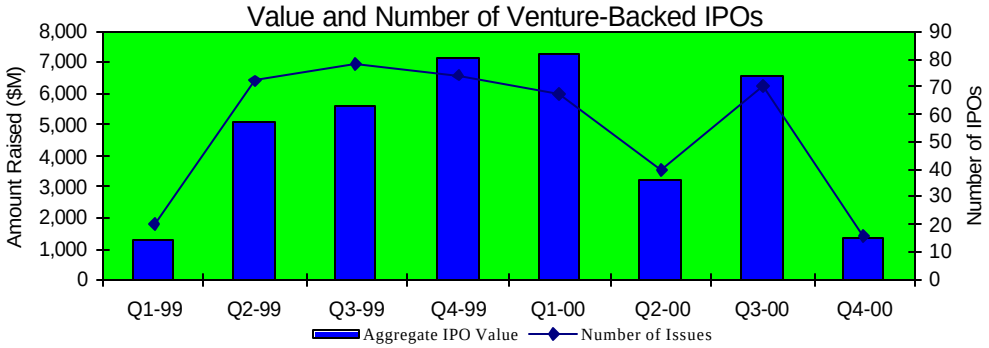
- …but, based on semiannual rebalancing, correlations have been rising only since 1998 and were even negative

- **How you measure it matters**

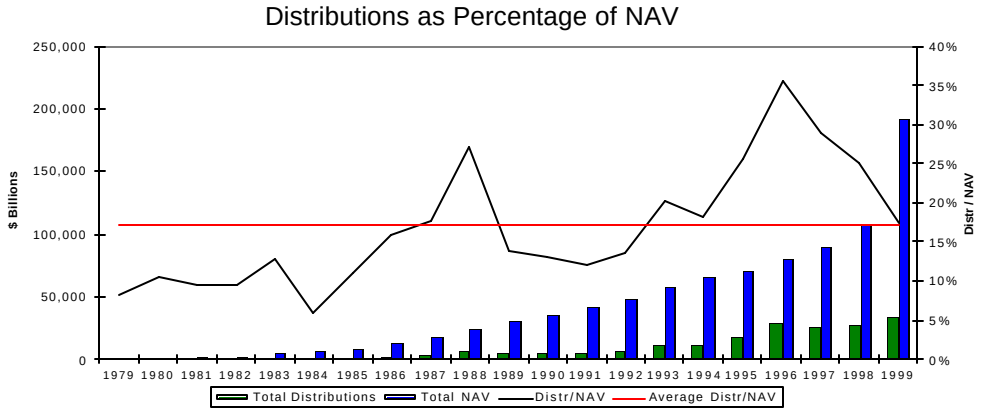
Private Equity Trends



- **Record commitments in 2000, expected slowdown in 2001...**

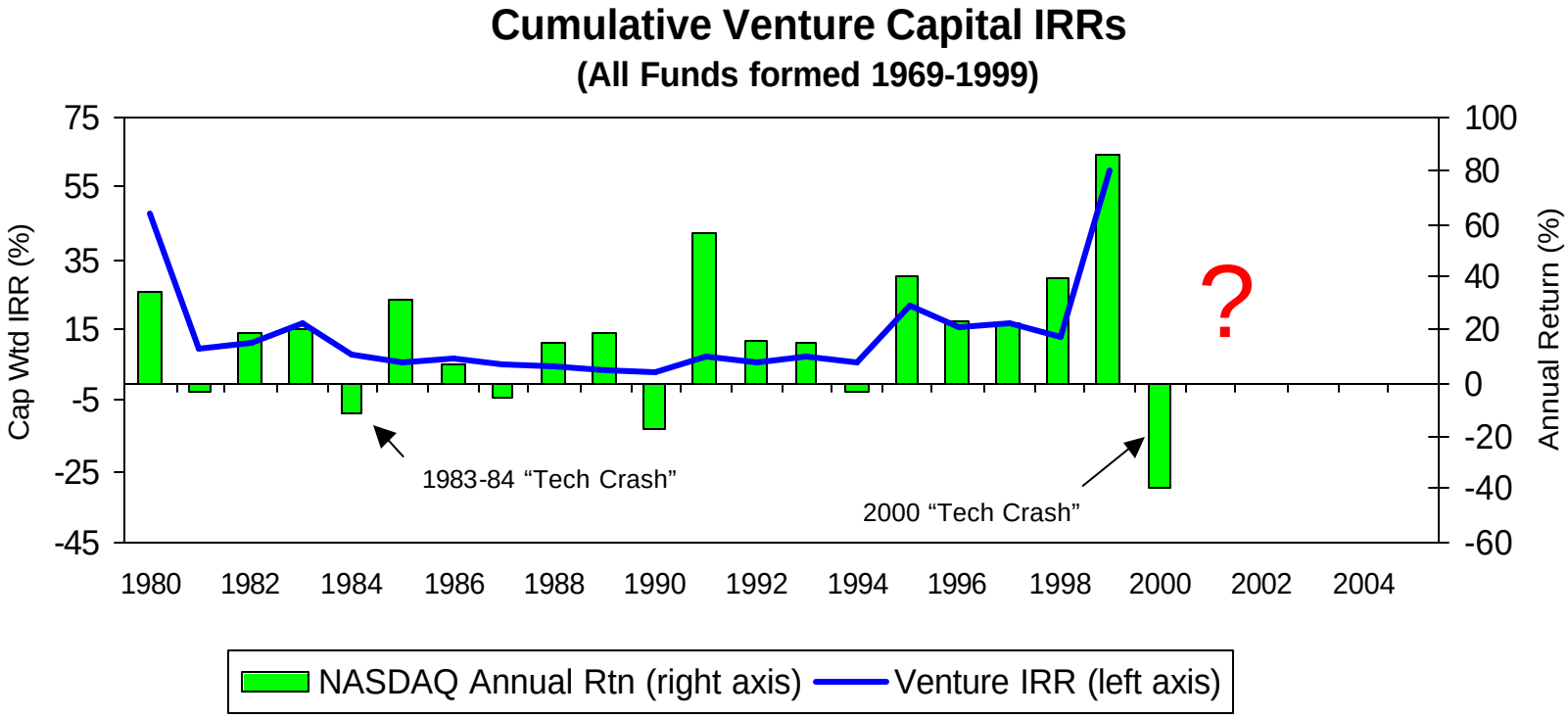


- **…but after record activity, IPO window now nearly closed...**



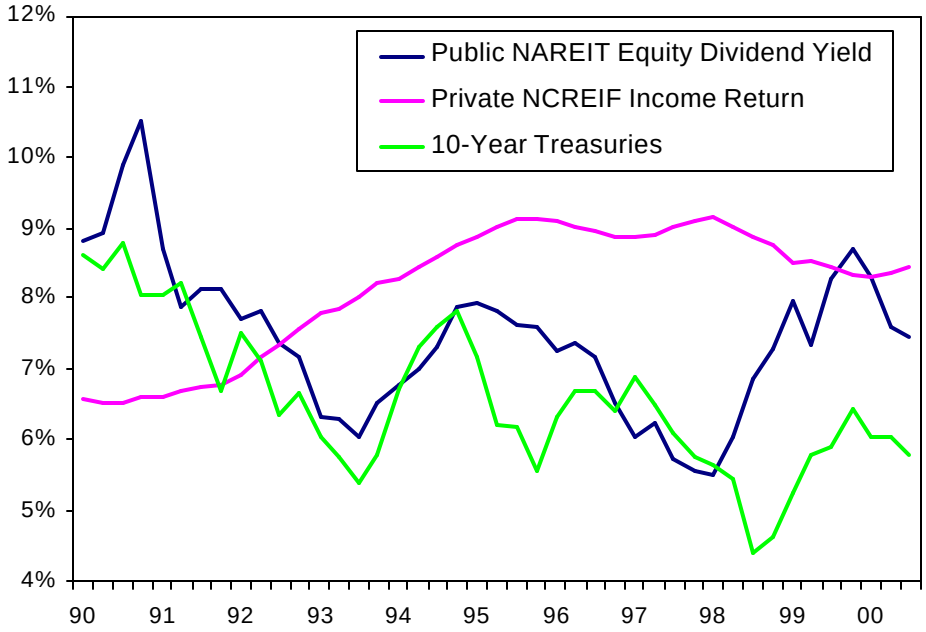
- **…payback pace exhibiting slowing trend**

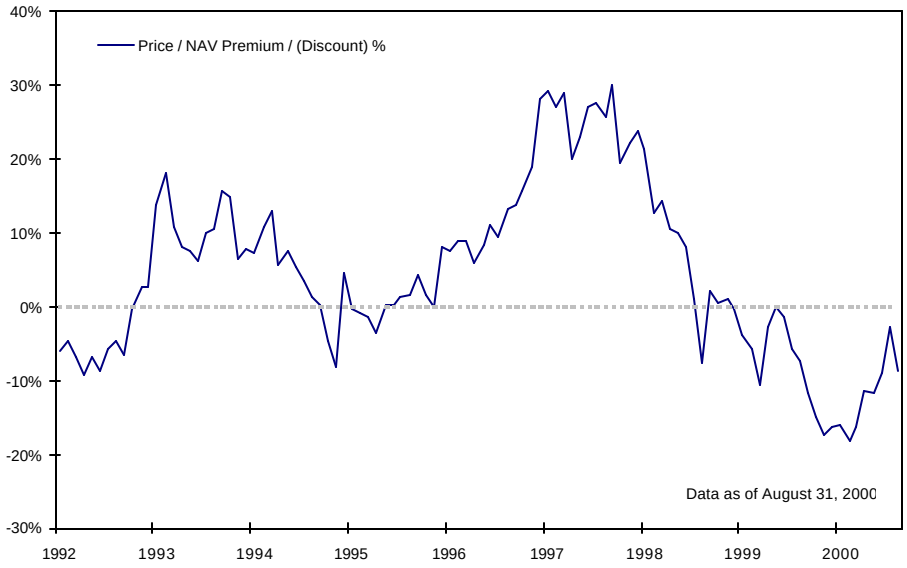
Private Equity Trends



- Venture capital exhibited declines after the 1983 public market technology "crash".
- Will venture capital experience similar declines over the next several years?

Real Estate Trends





- **Valuation trends in both public and private real estate still reasonable**

Attachment 2
Investment Committee – Item 8
June 6, 2001

The Role of Assets

by Pension Consulting Alliance, Inc.

2001

PENSION CONSULTING ALLIANCE, INC.

Domestic Equity

DEFINITION

- Ownership interest in publicly traded companies headquartered in U.S.
- Shares are SEC registered

SIZE OF MARKET

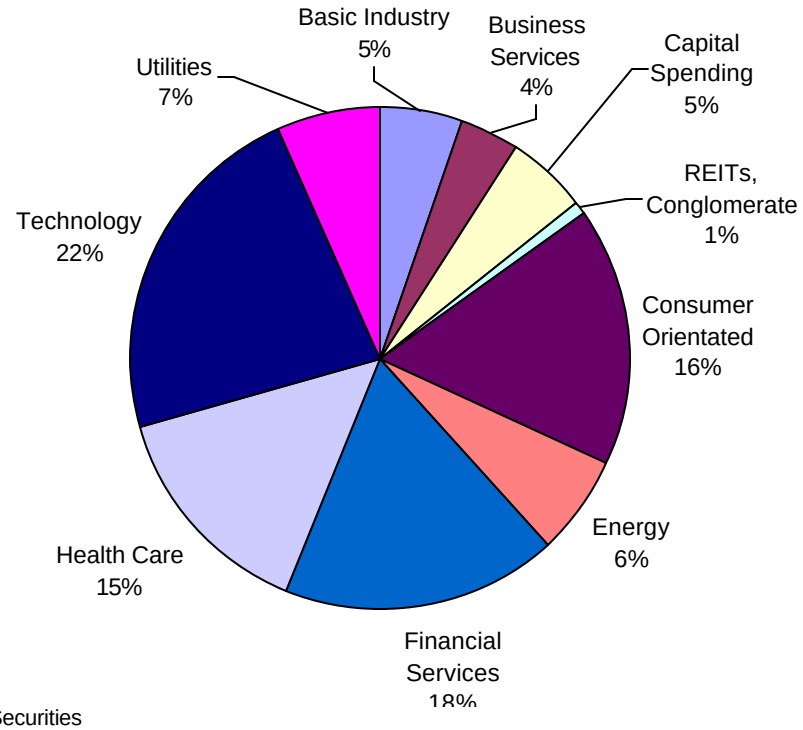
- $16.1 trillion total market capitalization as of 6/30/00 - Russell 3000

STRATEGIC ROLE

- High long-term real returns
- Hedge against active (pre-retirement) liabilities

Sector Breakdown of Russell 3000

(percentage of market cap as of 12/31/00)



Source: Prudential Securities

Domestic Equity

CHARACTERISTICS

- Relatively high returns (long-term)
- Relatively high volatility (standard deviation of returns)
- Relatively high liquidity
- Diversification

IMPLEMENTATION OPTIONS

- Passively managed portfolios used to capture market returns
- Actively managed portfolios expected to add value over passive funds
- Size of aggregate portfolio may impact implementation choice(s)

Domestic Equity

OPERATIONS

- Securities held by Master-Custodial bank
- Electronic transfer of securities through DTC
- Electronic trading systems, crossing networks, program trading available
- Independent market prices readily available daily from exchanges for listed securities
- Stocks traded over-the-counter can be daily-priced by market makers
- Numerous small capitalization stocks require considerable effort to vote proxies

COST RANKED IN ORDER OF MAGNITUDE

- Transaction costs
- Management fees for external managers
- Systems and custody costs
- Staff salaries/benefits/administration
- Consultant and legal costs

Domestic Equity

RISKS

- Absolute risk - possible magnitude of price decline
- Liability hedging risk - risk that assets will not increase when liabilities increase
- Regulatory risk - changes may adversely affect markets
- Tax risk - changes may adversely affect markets
- Liquidity risk - difficulty trading securities under adverse market conditions
- Firm specific risk - unique risks associated with a specific firm
- Tracking risk - magnitude of performance deterioration from a benchmark
- Time horizon - horizon too short to weather cycles
- Benchmark risk - benchmark not appropriate proxy

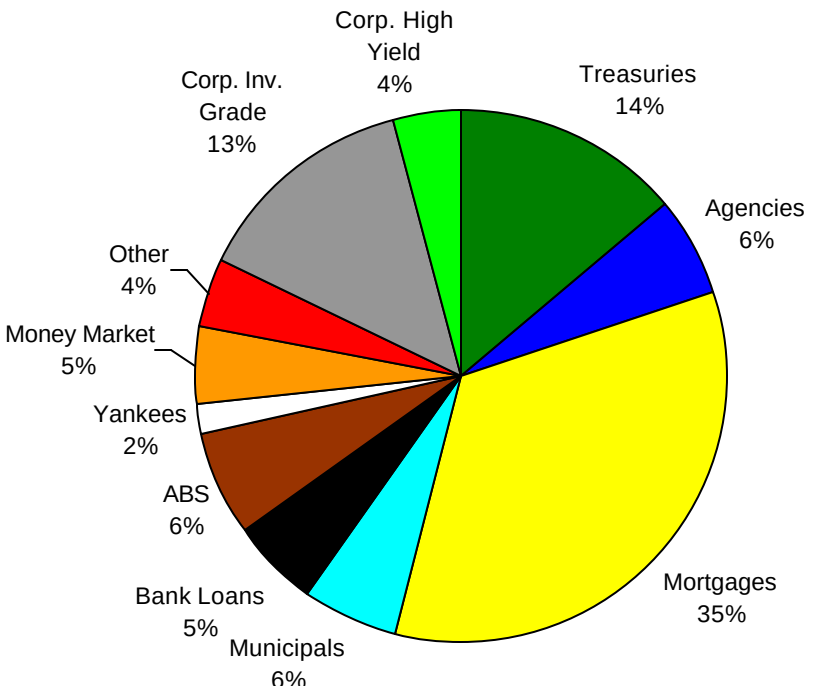
Domestic Fixed Income

DEFINITION

- Obligations in U.S. dollars of companies, governmental entities or agencies, banks, insurance companies, with finite lives domiciled in the U.S. or issued in the U.S.

SIZE OF MARKET

- $26 trillion total market capitalization as of 6/30/00



Source: Federal Reserve

Domestic Fixed Income

STRATEGIC ROLE

- Diversification within a multi-asset class, total return portfolio
- Hedge against a long duration accrued liability
- Current Income

CHARACTERISTICS

- Medium volatility asset class
- Relatively high liquidity
- Broadly diversified by market sector, quality, and maturity

IMPLEMENTATION

- Variety of implementation options:
  - Core only
  - Core-satellite approach
  - Sector specialties
  - Liability orientation

Domestic Fixed Income

OPERATIONS

- Securities held by Master-Custodial Bank
- Most securities are Fed Wireable
- Most of the market (U.S. Treasury and pass-through certificates) prices are readily available
- Bonds with less publicly available information (corporates and CMO's) can be priced by securities brokers

COST RANKED IN ORDER OF MAGNITUDE

- Transaction cost
- System and custody cost
- Staff salaries/administration

Domestic Fixed Income

RISKS

- Duration risk - price volatility from a change in overall interest rates
- Convexity risk - negative convexity is the risk of price declines being greater than the price increase due to interest rates moving equally up versus down
- Default or credit risk - the uncertainty surrounding the borrower's ability to repay its obligations
- Structure risk - risk that arises from the options implicit in bonds (like callability and sinking funds) or the rules that govern cash flow differ from expectations
- Sector risk - risk of holding sectors that are in different proportions than the benchmark
- Liquidity risk - cost of trading in a security which is reflected in the bid-ask spread or the cost of selling due to cash flow needs
- Reinvestment risk - the uncertainty surrounding future yield opportunities to invest funds which come available due to call, maturities, or coupon payments
- Benchmark risk - risk of the benchmark being in appropriate
- Yield curve risk - price changes induced by changes in the slope of the yield curve

International Equity

DEFINITION

- Ownership interest in companies headquartered outside the U.S.
- Publicly traded securities but subject to foreign registration requirements

International Equity

SIZE OF MARKET

- The total market capitalization for the Morgan Stanley Capital International ACWI ex-U.S. Index is now over $10 trillion.

- Total market capitalization for the Morgan Stanley Emerging Markets Index now exceeds $1 trillion.

MSCI ACWI EX. U.S. COUNTRY ALLOCATION

ACWI Free Ex USA as of 12/31/00

Country	Country Weight %	Region
Canada	4.29%	America
	4.29%	**America Total**
Taiwan	1.13%	Emerging
Brazil	1.02%	Emerging
South Africa	0.94%	Emerging
Mexico	0.92%	Emerging
Korea	0.89%	Emerging
India	0.72%	Emerging
China	0.63%	Emerging
Malaysia	0.62%	Emerging
Israel	0.56%	Emerging
Greece	0.53%	Emerging
Chile	0.30%	Emerging
Turkey	0.27%	Emerging
Russia	0.19%	Emerging
Argentina	0.14%	Emerging
Thailand	0.14%	Emerging
Poland	0.14%	Emerging
Hungary	0.09%	Emerging
Indonesia	0.08%	Emerging
Philippines	0.08%	Emerging
Czech Republic	0.06%	Emerging
Venezuela	0.04%	Emerging
Peru	0.03%	Emerging
Colombia	0.03%	Emerging
Pakistan	0.03%	Emerging
Jordan	0.01%	Emerging
Sri Lanka	0.00%	Emerging
	9.59%	**Emerging Total**
United Kingdom	18.22%	Europe
France	9.97%	Europe
Germany	7.53%	Europe
Switzerland	6.15%	Europe
Netherlands	4.87%	Europe
Italy	4.08%	Europe
Spain	2.49%	Europe
Finland	2.42%	Europe
Sweden	2.28%	Europe
Belgium	0.80%	Europe
Denmark	0.78%	Europe
Ireland	0.54%	Europe
Portugal	0.45%	Europe
Norway	0.38%	Europe
Austria	0.20%	Europe
	61.16%	**Europe Total**
Japan	19.37%	Pacific
Australia	2.29%	Pacific
Hong Kong	1.83%	Pacific
Singapore	0.86%	Pacific
New Zealand	0.09%	Pacific
	24.44%	**Pacific Total**
	100.00%	**Grand Total**

Source: BGI

International Equity

STRATEGIC ROLE

- Increase overall portfolio diversification, less than fully correlated with other assets, improving risk-return tradeoff
- Increase investment opportunities
- Increase total return

CHARACTERISTICS

DEVELOPED MARKETS

- Relatively high real long-term returns
- Relatively high liquidity
- Relatively high volatility
- Correlation with US equities is about .33
- Currency adds to volatility but can be hedged which mutes the diversification benefits

EMERGING MARKETS

- Higher expected returns due to economic growth potential
- Liquidity risk is significant
- High volatility
- FX markets not sufficiently developed to hedge currency risk
- Limited access to markets
- Market information less abundant than for developed markets
- Correlation between emerging markets and EAFE index is surprisingly low

International Equity

IMPLEMENTATION OPTIONS

- Externally managed active portfolios
- Externally managed passive portfolios
- External management beneficial due to high level of staffing and expertise necessary to follow foreign stock and currency market
- Active management has at times produced better results outside U.S.

OPERATIONAL

- DOT-style trading systems still in infancy
- Electronic trading systems, crossing networks, available but do not provide any real volume at present
- Liquidity varies widely in Non-US equity markets
- Settlement mechanisms continue to improve with a trend towards shorter settlement periods
- Independent market prices not readily available in some markets
- Tax reclamation

International Equity

COSTS RANKED IN ORDER OF MAGNITUDE

- Transaction Costs (approximately 48 basis points)
  - Broker commissions are becoming the least significant component of execution costs
  - Spread and Market impact higher than the U.S. market
  - Timing: cost of a delayed execution from time decision is made to buy/sell
  - Ticket costs higher $25 to $100 versus $10 to $25 per transaction in the US
  - Transaction taxes
- Management fees (average 25 basis points whereas passive is much lower)
- Withholding taxes
- Currency-overlay management fees (5 to 6 basis points)
- Custodial fees (approximately 3.3 basis points)
  - Maintaining sub-custodial networks in local markets
  - Operational issues dominated by local market regulations
  - Master custodian integrates information from local sub-custodians creating longer lead time and increased error rate in reporting
- Consultant fees
- Staff salaries

International Equity

RISKS

- Market risk - price decline
- Structural risk from deflation
- Currency risk
- Counterpary risk
- Liquidity risk
- Political risk
- Liability hedging risk
- Liabilities denominated in U.S. dollars
- Benchmark risk
- Regulatory risk
- Firm specific risk

International Fixed Income

DEFINITION

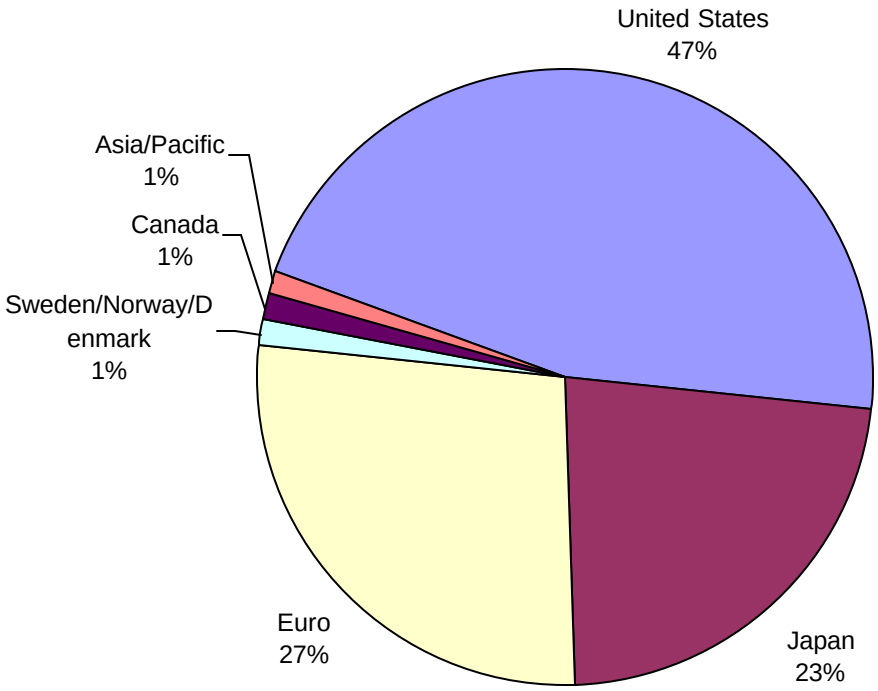
- The debt obligations of companies, government entities or supra-national agencies domiciled outside the U.S., issued in a currency other then the U.S. dollar.
- Markets consist primarily of bonds issued by the central governments of major developed economies.

International Fixed Income

SIZE OF MARKET

- The Lehman Global Aggregate Index contains over ten thousand issues from 45 markets with an aggregate market value of nearly $13 trillion. Fifty-five percent of the global bond market is non-U.S.

- Non U.S. markets are changing drastically due to changes in Euro and evolution of new credit markets, particularly in Europe.



Source: T Rowe Price, 12/31/00

International Fixed Income

STRATEGIC ROLE OF INTERNATIONAL FIXED INCOME

- Not highly correlated with other asset classes, provides diversification to U.S. assets.
- Provides improvement in the total portfolio's risk/return tradeoff at same levels of risk.
- Hedge against unexpected domestic inflation.
- Possibility of return enhancement through active management.

CHARACTERISTICS

- Medium or average volatility lower if hedged.
- There is a large currency component to international fixed income returns.
- The developed markets are extremely liquid. Many issues of less developed markets are also relatively liquid.
- Less than fully correlated with other asset classes.
- High historic yields.
- Broadly diversified by country but dominated by the G-6 markets: Japan, Germany, France, Italy, the U.K. and Canada.

International Fixed Income

IMPLEMENTATION

- Emphasis on active management, allowing swift execution of market allocation strategies.
- Emphasis on external management, due to the high level of staffing and expertise necessary to follow foreign bond and currency markets.
- Currency allocations are actively managed by portfolio managers.
- The U.S. investor can not receive the local market return.

OPERATIONS

- Individual markets vary as to settlement procedures and custody arrangements. All markets included in the principal indices have sufficient depth and liquidity to be highly investable.
- Market exposure can be achieved or modified through derivative instruments.
- Settlement is normally in the local currency of the specific bond market.
- There is increasing movement to the global convention of “T+3” settlement.
- The master custodian consolidates information from local sub-custodians generally causing reporting times to be longer than for U.S. securities. Pricing is also difficult in relation to U.S. securities.

International Fixed Income

COSTS RANKED IN ORDER OF MAGNITUDE

- Custody costs (approximately 3.3 bps.) and withholding taxes (as high as 36 bps)
- External management fees (base fee 7.5 bps., normal fee 13.0 bps.)
- Transaction costs (approximately 4 bps.)
- Staff costs
- Consultant fees

International Fixed Income

RISKS

- Currency risks:
  - The risk of currency movements vs. the dollar for each market. Currency may contribute greatly to return and lowers correlation.
  - Counterparty risk
- Fixed income risks
  - The primary risk associated with local bond returns is volatility related to unexpected changes in: inflation, the business cycle, interest rates, and the availability of credit.
  - Other bond market risks include:
    - Political risk (sovereign risk, regulatory risk)
    - Event risk
    - Counterparty risk
    - Liquidity risk

Alternative Investment/Private Equity

DEFINITION

- Ownership interest in privately-held companies headquartered in U.S. and overseas

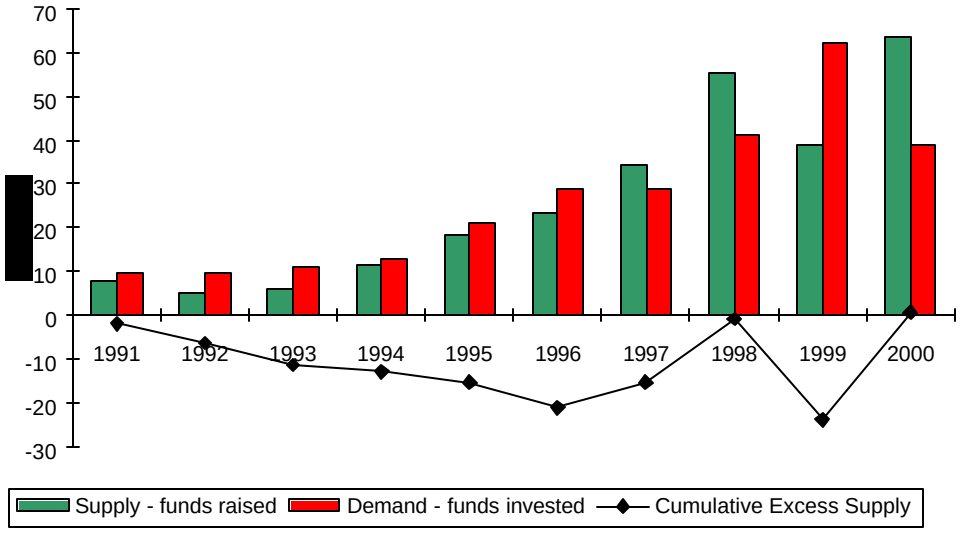
- Types of transactions:
  - Indirect - partnership form
  - Direct - negotiated directly between investor and issuer

Alternative Investment/Private Equity

COMMITMENT AND INVESTMENT TRENDS IN THE PRIVATE EQUITY MARKETS

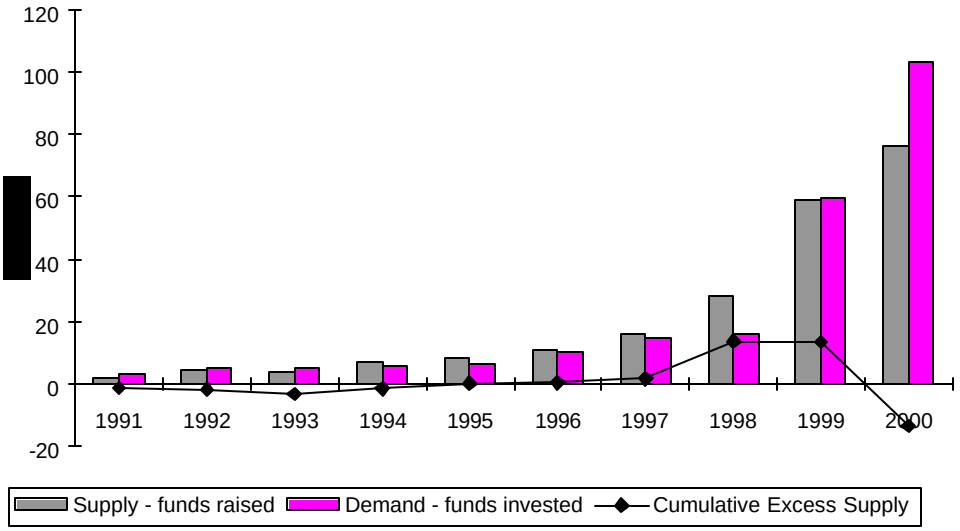
Buyout Fund Supply / Demand Comparisons

Commitments and investments of leverage buyouts



Venture Capital Fund Supply / Demand Comparisons

Commitments and investments of venture capital



Source:Private Equity Analyst, Buyouts, Venture Capital Journal, PCA

Alternative Investment/Private Equity

STRATEGIC ROLE

- Enhance total portfolio return - expected return at 500 basis points over public equities
- Improve funded status with returns in excess of actuarially assumed interest rate
- Reduce total portfolio risk through diversification and negotiation of terms and conditions:
  - Highest variability of returns of any asset class
  - Low covariance of returns with other asset classes

CHARACTERISTICS

- Investments are equity or equity-linked securities
- Securities are not publicly traded, initially
- Investments are usually highly illiquid and involve a long (7-12 year) holding period

Alternative Investment/Private Equity

IMPLEMENTATION

- Due diligence
- Negotiation of terms and conditions
- Monitoring
- Accounting
- Marketing
- Policy development
- Priority setting

Alternative Investment/Private Equity

OPERATIONS

- Custody - securities held by limited partnerships
- Pricing - investments carried at cost until significant event:
  - Exits
  - IPO
  - Sale to another entity
  - Material positive or adverse event
- Reporting
  - Internally generated transaction reports available monthly
  - Master custodial pricing and reporting available monthly, consisting of carried/ market value of investments
  - Consultant monitoring and investment performance reports available quarterly and annually
  - General partner monitoring, investment performance, and financial reports available quarterly and annually
  - Audited partnership financial reports available annually for all partnerships

Alternative Investment/Private Equity

COST RANKED IN ORDER OF MAGNITUDE

- General partner fees
- Consultant fees
- Master custody costs
- Staff salaries/benefits/administration

RISKS

- Liquidity risk - absence of liquidity and appropriate exits could significantly increase time horizon
- Time horizon - seven to twelve years
- Firm specific risk - unique risks associated with a specific firm
- Tax risk - changes may adversely affect markets
- Regulatory risk - changes may adversely affect markets
- Strategy risk - continuing applicability of investment strategy in context of capital flows

Real Estate

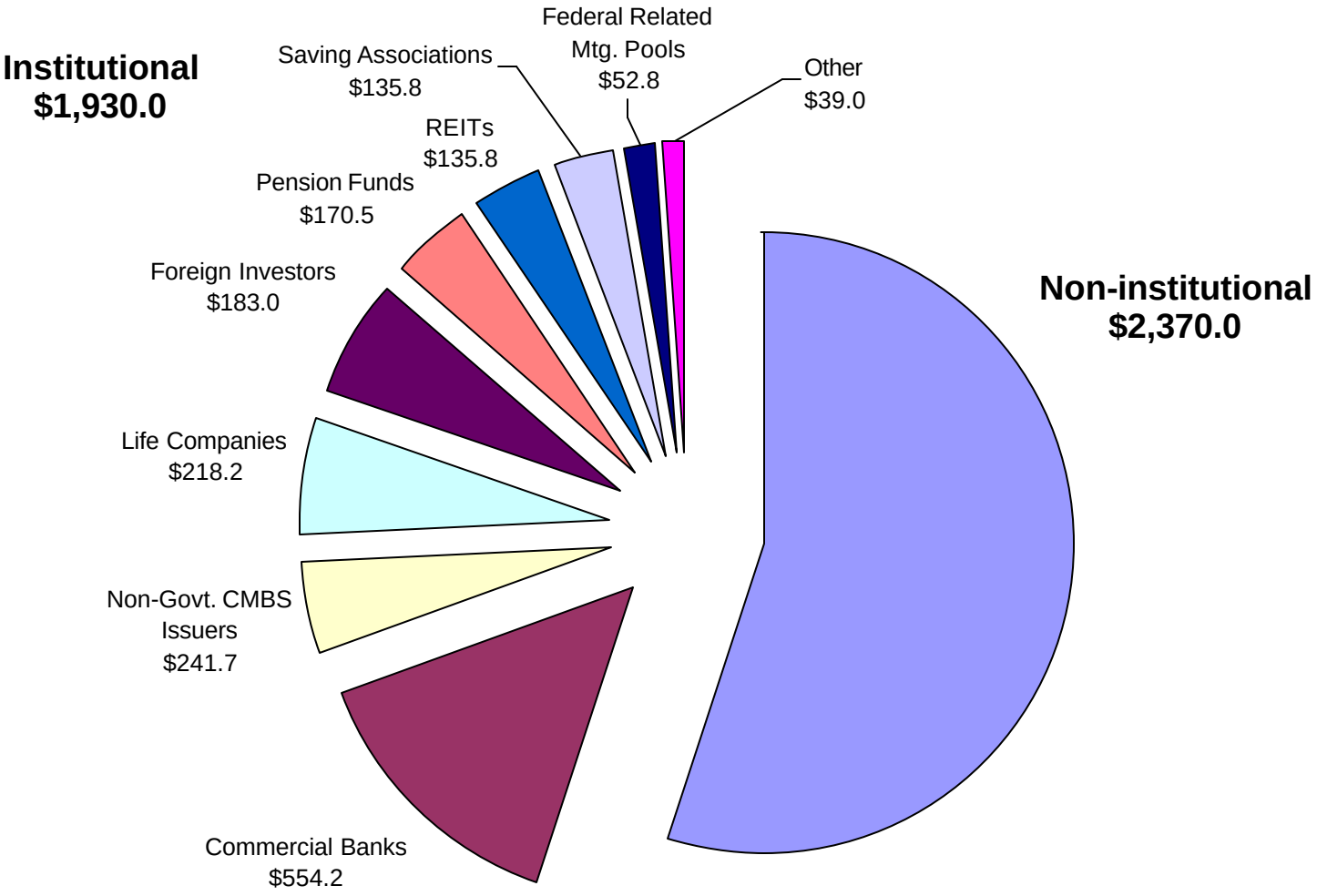
DEFINITION

- A right or interest in land, improvements, or real property

Real Estate

SIZE OF MARKET
TOTAL U.S. REAL ESTATE: $4.3 TRILLION

As of Sept 15, 200
In Billions



Source: Lend Lease Investment Research, *Emerging Trends in Real Estate 2001*

Real Estate

STRATEGIC ROLE

- Reduces risk of composite multi-asset portfolios through diversification
- Relatively low correlations to domestic equity; international equity and fixed income markets
- Serves as an inflation hedge during periods of high inflation when market is in relative equilibrium
- Provides an attractive return relative to fixed income asset class in periods of low moderate inflation
- Potential for high returns in niche opportunities

CHARACTERISTICS

- Risk- volatility of private real estate falls between publicly-traded debt and publicly-traded equities.
- Returns- nominal returns are expected to fall between equities and fixed income
- Iliquidity- transactions require a significantly longer period to execute than other asset classes.
- Inefficient Market-information affecting real estate asset valuation and market trading is not rapidly, accurately, or efficiently reflected or interpreted in its pricing.

Real Estate

IMPLEMENTATION

- Market Pricing Inefficiencies - Translates in to acquisition delays due to extensive, up-front due diligence requirements to justify pricing.
- High Transaction Costs & Delays - On both a dollar and timing basis due to the private market nature and the inherent legal deal structure complexities.
- Units of Trade Size Concern - Asset "lumpiness" can result from the inability to acquire real estate assets at specific quantities.
- Personnel Commitment - Sizable "up-front" overhead requirements, either in-house and/or outside, in order to understand and react to the "local" real estate market dynamics of each asset at acquisitions.

Real Estate

OPERATIONS

- High Management Intensity - Unlike securities, each individual asset must be intensely managed in order to maximize its return potential.
- Personnel Commitment - Sizable “ongoing” overhead requirements, either in-house and/or outside, in order to understand and react to the “local” real estate market dynamics of each asset to enhance its value during its holding period.
- Control Requirements - Sizable financial, accounting, legal and documentation controls must be committed internally and/or externally due to the “active and private” nature of the asset class.
- Iliquidity - Extensive lag time in executing sales strategies
- Valuation - Slow, difficult, and historical data biased

Real Estate

COSTS, RANKED IN ORDER OF MAGNITUDE*

- Property Management Fees;
- Asset Management Fees (Fixed or Fixed plus incentive based);
- Acquisition/Disposition Fees;
- Other Transactional / Ongoing costs (Real Estate Consultants; Legal; Mechanical, Electrical, and Structural Engineering; Environmental Engineering; Seismic Engineering; Appraisal & Performance Measurement costs);
- Staffing Costs;

* Those investors that must pay for most of these services at market prices on the outside are at a disadvantage over investors that have some of these capabilities in-house.

RISKS

- Property Type Risks - Negative changes in demand/supply conditions by property type

Real Estate

- Location Risks - Local market condition relative to the adverse changes surrounding a property.
- Tenant Credit Risks - Failure by a tenant to pay what is contractually owed.
- Physical/Functional Obsolescence -Negative influences on buildings due to technological changes, outdated layout and design features, and physical depreciation.
- Interest Rate Risk - Higher rates can negatively impact both sales strategies and leveraged properties at refinancing.
- Reinvestment Risk - In a declining rental rate market, cash flow received, may not be reinvested at the same level.
- Business Cycle Risk - As economies slow down, there may be less demand for space.
- Inflationary Risk - Rent levels may not always keep up with rising operating expense levels.
- Iliquidity - Inability to effectively liquidate a property in to cash.

2001 Ten-Year Return, Risk, and Correlation Assumptions ***(preliminary)***

Last revision: 1/01

Average Annual Risk Premiums

Real Risk-Free Rate	2.50
Risk Premiums over Real Risk-free Rate:	
Treasury Inflation Protection Securities	1.00
Domestic Core Bonds	1.25
International Bonds	1.15
Hedged International Bonds	1.00
Global Bonds	1.20
Hedged Global Bonds	1.05
Real Estate*	3.00
Domestic Stocks	5.00
International Stocks	5.10
Hedged International Stocks	5.00
Alternative Investments/Venture Capital	9.00

Nominal & Real Return and Risk Estimates—2.5% long-term inflation assumption

	Expected Avg. Nominal Annual Return	Expected Risk of Nominal Returns (Annlzd. SD)
Cash	5.00	1.0
Treasury Inflation Protection Securities	6.00	3.0
Domestic Core Bonds	6.25	9.0
International Bonds	6.15	11.0
Hedged International Bonds	6.00	9.0
Global Bonds	6.20	9.0
Hedged Global Bonds	6.05	8.0
Real Estate*	8.00	13.0
Domestic Stocks	10.00	20.0
International Stocks	10.10	22.0
Hedged International Stocks	10.00	20.0
Alternative Investments/Venture Capital	14.00	32.0

***Real estate asset class assumes a mix of core real estate and a variable allocation of between 5% and 20% real estate securities.**

2001 Ten-Year Return, Risk, and Correlation Assumptions ***(preliminary)***

Last revision: 1/01

Nominal Return Correlation Assumptions

	Cash	TIPS	CoreBds	IntlBds	HIntlBds	GlblBds	HGlblBds	RealEst	USStks	IntlStks	HIntlStks	AltVent
TIPS	.75											
CoreBds	.50	-.20										
IntlBds	.20	.00	.45									
HintlBds	.30	-.20	.65	.65								
GlblBds	.20	.35	.50	.95	.50							
HGlblBds	.30	.15	.90	.50	.95	.65						
RealEst	.35	-.20	.20	.10	.30	.10	.10					
USStks	.25	-.20	.40	.20	.50	.40	.50	.25				
IntlStks	.00	.00	.00	.45	-.10	.20	.10	.10	.50			
HintlStks	-.25	-.05	.00	.10	.10	.00	.00	.00	.50	.65		
AltVent	.00	.30	.00	-.15	.00	.00	-.20	.25	.50	.50	.85	
CPI	.25	.50	-.15	-.30	-.20	-.10	-.20	.00	-.50	-.20	-.20	.00

Key to Asset Classes and Benchmarks

Acronym	Asset Class (benchmark)
AltVent	Alternative/Venture Capital (Brinson Venture Capital Index and the Venture Economics Post Venture Index)
Cash	Cash/Money Market (90 Day TBills)
CoreBds	Core Bonds (Lehman Universal Bond Index)
GlblBds & HGlbllBds	Global Bonds (Salomon World Government Bond Indices)
IntlBds & HIntlBds	International Bonds (Salomon Non-U.S. Government Bond Indices)
IntlStks & HIntlStks	International Stocks (A combination of MSCI EAFE & ACWI Indices)
RealEst	Real Estate (A combination of NARIET and NCREIF Equity Real Estate Indices)
USStks	U.S. Stocks (assessed both Russell 3000 and S&P 500 Indices)

Notes:

PCA developed its average annual return premiums and standard deviation estimates using a combination of approaches. First, PCA studied historical time series over both one-year and five-year holding periods to uncover any specific trends in the time series data. For example, domestic stock return premiums exhibited cyclical behavior, with each cycle lasting approximately 50 years. Second, PCA reviewed outlook opinions from a handful of leading investment banks and investment advisory firms. PCA compiled these opinions to develop consensus expectations for the major asset classes. PCA then used these consensus expectations as reference checks against its own expectations. Finally, PCA professionals discussed and debated asset expectations internally until a consensus view developed.

In recognizing that correlations are not always stable, PCA analyzed the current behavior of the correlations among all pairs of asset classes. We identified ranges for each correlation over specific holding periods. Five asset classes have history going back to 1926. These asset classes are: Treasury Bills, Intermediate and

2001 Ten-Year Return, Risk, and Correlation Assumptions ***(preliminary)***

Last revision:
1/01

Long Government Bonds, Domestic Stocks, and Small Stocks. In analyzing the correlation trends among pairs of assets, we focused on correlation trends across non-overlapping five-year holding periods. For correlation pairs containing less than 15 years of annual data, we analyzed correlations of annual returns.

PCA describes a correlation pattern in one-of-five descriptions: uptrend, downtrend, no pattern, stable, and cyclical. For those pairs having less than 15 years of data, we used the average correlation for our expectation.